

## On Japanese Species of *Corbicula*.

BY

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(With Plate VII).

The first records of *Corbicula*, from Japan were by Temple Prime, in 1864, who described two species, *C. leana* and *C. japonica*. In 1878 Dr. O. Reinhardt reviewed the Japanese species in a valuable paper, describing several new forms. Later, they were included by Clessin in his monograph of the family, and by Kobelt in his useful *Fauna*, 1879. Professor von Martens (1877), and the present writer (1901) have also contributed to the literature of the group.

Specific differences in *Corbicula* are not strongly developed, though a great deal of local differentiation is evidently in progress, so that one can almost say that every lot gathered has its own minor peculiarities. In this multitude of forms differing by slight, often hardly definable, characters, it is difficult to define conventional species. As in the holarctic *Pisidia*, the modifications have in a large degree not reached the "specific" stage. Yet by taking account of only their more important features, the known Japanese forms may be grouped into less than a dozen reasonably well-characterized species, though it cannot be claimed that every specimen or form which may be encountered can easily be referred to one or other of them.\*

The following descriptions are based chiefly upon a series of specimens from the Imperial Household Museum, furnished by Mr. T. Iwakawa; but I have also studied specimens presented to the Academy of Natural Sciences by T. Prime, Y. Hirase and others.

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\* In dealing with the Chinese species, Père Heude has attempted to name every local form, a task I believe to be practically impossible, and if accomplished the result would be absolutely useless to any other zoologist from the impossibility of again recognizing the forms.

**Key to Species.****I. Nymphs strongly roughened (see the text-figure on p. 155.)**

- a.* Shell oval, coarsely ribbed, the hinge-line arched.
  - b.* Cavity of the valves white or violet-tinted, becoming deep violet below the pallial line; beaks moderately projecting; shell of medium size.  
*C. leana* Prime.
  - b'.* Interior purple; beaks very low; upper margin of valves not more arched than the lower margin; shell small and delicate. *C. awajensis* Pils.
  - a'.* Shell subtriangular, the valve-borders straightly sloping from the beaks; lateral teeth long and straight; exterior rather finely ribbed; size large.  
*C. orthodonta* Pils.

**II. Nymphs nearly smooth, only minutely roughened.**

- a.* Exterior partly smooth on the convex or median portion of the valves.
  - b.* Shell oval-triangular. *C. japonica* Prime.
  - b'.* Triangular, the beaks very large and prominent; hinge very strong.  
*C. sandai* Reinh.
- a'.* Exterior coarsely ribbed; interior violet, paler or whitish in the cavity; cardinal teeth oblique; length 27, alt. 23.5, diam. 15.2 mm. *C. viola* Pils.
- a''.* Exterior densely striate or rib-striate.
  - b.* Shell oblong, with low beaks and low-arched hinge-margin.  
*C. sadoensis* Pils.
  - b'.* Shell subtriangular, with prominent beaks and more angular hinge-margin.  
*C. nipponensis* Pils.

There is another species, or group of closely related species, which I have not seen, though they are from around Yokohama. This species or group has received the following names: (1) *C. fuscata* var. *atrata* Reinh., renamed *C. Martensi* by Clessin; (2) *C. donitziana* Cless.; (3) *C. transversa* Cless., = *C. ovalis* Reinh., and perhaps the same as *C. Yokohamensis* Sowerby (*Conch. Icon.* XX, pl. 12, fig. 55).

The collection from the Imperial Household Museum contains the following species:

*Corbicula leana* Prime. (Plate VII, fig. 5, 6.)

*C. leana* Prime, Ann. Lyc. Nat. Hist. of New York, VIII, p. 68 (Japonia).

*C. reiniana* Clessin, Conchylien Cabinet, Cycladeen, p. 196, pl. 39, f. 8, 9 (Yokohama).

? *C. straminea* Reinhardt, Jahrb. d. Malak. Ges. V, 1878, p. 186, pl. 5, f. 1 (Hakone Lake).

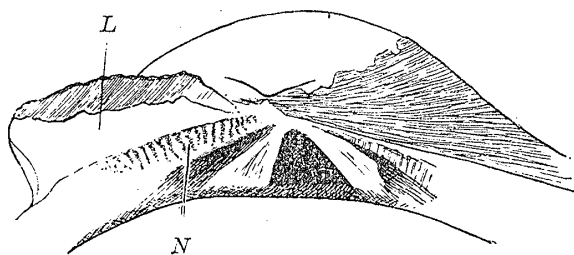
? *C. pexata* Reinh., l.c. p. 193, pl. 5, f. 6. Kobelt, Fauna, p. 156, pl. 20, f. 2.

This common and wide-spread species may be recognized by its coarsely sculpture nymphs (see the woodcut), coarse ribs of the exterior, and triangular-oval shape. It varies from yellow or greenish yellow in young and half-grown shells, to black in old ones, and the interior is violet. The specimens before me are from the following localities.

Hondō: Shinainuma, Rikuzen; Kasumigaura, Hitachi; Tokyo and Niisomura, Musashi; Gifu, Mino; Kahokugata, Kaga; Koyamaike, Inaba; Osaka and Shikanjima, Osaka, Idzumi.

Shikoku: Kotohira, Sanuki.

Kyūshū: Saga, Hizen; Yanagawa, Chikugo; Kagoshima and Sendagawa, Satsuma.



Part of the hinge of the left valve of *Corbicula leana*, showing the broken ligament *L*, and the nymph *N*.

The specimens from Satsuma are all small, those apparently adult measuring 20 to 24 mm. long. In Hizen they are also small, not exceeding 25 mm. long; but some localities in the north also supply equally small shells. In many places, as around Osaka, they grow to a length of 30 to 40 mm.

From Lake Suwa, Shinano, a series of peculiar shells was collected, measuring only 18 to 22 mm. long, the outside pale greenish yellow, the interior whitish in the cavity, pale purple below the pallial line. These shells agree with *C. leana* in sculpture etc., but differ in the color inside, all other *leana*, I have seen being violet.

Although it is widely distributed, I have not seen this or any other *Corbicula* from Yesso.

I have not seen specimens of *C. straminea* Reinh. from Hakone Lake, the type locality, but I cannot see, from the description and figures, that it differs materially from the young of *C. leana*. This question may be taken up again when a collection is made at Hakone.

*Corbicula orthodonta* n. sp. Plate VII, fig. 1, 2.

The shell is somewhat triangular, the upper margins sloping steeply and straight on each side of the high beaks, the basal margin evenly arcuate. The anterior end is broadly rounded, the posterior end narrower and somewhat lengthened. The glossy surface is sculptured with rather closely set ribs, slightly narrower than the intervals, and about one millimeter from crest to crest in the middle of the valve. In old shells the ribs are obsolete near the basal margin. The color is greenish-yellow with wide blackish zones, old shells being mainly black. The interior is lusterless, violet-tinted white. The hinge is rather narrow. Nymphs narrow and strongly roughened. In the right valve the posterior cardinal tooth is parallel to and in line with the posterior lateral, but the posterior edge of the anterior cardinal tooth points towards the middle of the basal margin. In the left valve the upper end of the anterior lateral tooth is separated from the adjacent cardinal tooth by a deep furrow. The muscle impressions are small but distinct.

Length 48, height 42.5, diam. 25.5 mm.

„ 46, „ 40.5, „ 24.5 „

Habitat, Owari.

The unusually straight slopes of the dorsal borders of the valves, on both sides of the rather small but high beaks give this mussel a some-

what triangular outline. It is further distinguished by the moderately fine rib-striae, the long straight lateral teeth, rough nymphs, and the rather light structure for so large a shell. It does not seem to be a common mussel; I have seen only the type lot, sent by Mr. Iwakawa, and several shells collected by Mr. John B. Henderson.

*Corbicula japonica* Prime.

*C. japonica* Prime, Annals Lyc. etc., VIII, p. 68 (Japan, Gulick).

*C. biformis* Reinh., Jahrb. d. Malak. Ges. 1878, p. 189, pl. 5, fig. 3.

Tokyo (Rein); Tokushima, Awa (Iwakawa). Distinguished by its partly smooth exterior, which has irregularly spaced riblets on the lower half and on the anterior end. The beaks are much smaller than in *C. sandai*, and the hinge is narrower.

*Corbicula sandai* Reinhardt. Plate VII, fig. 17, 18.

Jahrb. d. Malak. Ges. V, 1878, p. 187, pl. 5, f. 2.

Kyoto (Rein); Lake Biwa and Seta, Omi; Sendaigawa and Kago-shima, Satsuma (Iwakawa and Hirase).

Known by its large, high and inflated beaks and strong teeth. It varies from yellowish olive to black externally, violet or white inside, or in some places it is yellow or olive-yellow outside, pinkish white with salmon-tinted border within. This light form often has violet stains on the teeth.

This species has not been found north of Lake Biwa.

Some small and very pretty specimens were taken with *C. sandai* at Sendaigawa, Satsuma. They are nearly smooth near the beaks, which are not worn. The outside is light yellow, largely covered with black zones and hair-like radial lines forming rays. The interior is white, with a yellowish tint at the basal margin. The posterior end is broadly and indistinctly truncate.

*Corbicula viola* n. sp. Plate VII, fig. 7, 8, 9, 10.

The shell is ovate or triangular-oval in outline, rather coarsely sculptured with narrow riblets which are rather widely spaced. On the posterior slope the riblets disappear, giving place to a dull, somewhat lamellose cuticle, but elsewhere the surface has a varnish-like gloss. It is yellow with brown concentric streaks, or in older shells, brownish-black with some light streaks. The anterior end is broadly rounded, the dorsal border highly arched, with rather prominent beaks, the slopes slightly convex; the posterior end is narrower and more lengthened than the anterior.

The interior is dark violet below the pallial line, lighter or whitish-violet in the cavity. In the right valve both cardinal teeth are oblique, nearly parallel with the posterior lateral tooth. In the left valve the anterior lateral is separated by a deep notch from the adjacent cardinal tooth. The narrow nymphs are only very minutely roughened.

Length 27, alt. 23.3, diam. 15 mm.

Chikumanaiko, Lake Biwa. Types collected by Mr. T. Iwakawa.

This seems from the material at hand to be a distinct species, differing from *C. japonica* and *C. sandai* by the development of ribs over the whole median portion of the valves, and from *C. nipponensis* by the coarse sculpture and more oblique cardinal teeth. It differs more fundamentally from *C. lcana* and its immediate allies by the much less coarsely roughened nymphs.

*C. viola* is rather a small mussel, and those received have a dingy exterior until cleaned, being thinly covered with a ferrous deposit.

*Corbicula sadoensis* Pilsbry. Plate VII, fig. 15, 16.

Proc. Acad. Nat. Sci. Phila. 1901, p. 406 (Sado).

Sado Island (Hirase); Kahokugata, Kaga (Iwakawa). Closely related to *C. nipponensis*, but longer and less high, with the hinge margin much less curved.

*Corbicula awajiensis* Pilsbry. Plate VII, fig. 13, 14.

Awaji Island.

*Corbicula nipponensis* n. sp. Plate VII., fig. 3, 4.

Shell rounded-oval, with moderately elevated beaks; oliveaceous with chestnut or blackish concentric streaks or zones, or mainly black with some lighter zones, the posterior slope usually black. Surface glossy as though varnished; rather finely striated, but often irregularly so. Lunule defined by a narrow raised line. Dorsal slopes of the valves convex, ends rounded, the posterior end slightly more produced. Hinge strong, the nymphs wide and only very minutely roughened. Cardinal teeth diverging, the middle one subvertical in the right valve, oblique but not parallel to the posterior lateral in the left valve. The anterior lateral tooth in the left valve is well separated from the adjacent cardinal by a deep notch. Interior violet whitish, usually with a dark violet band along the basal margin.

Length  $40\frac{1}{2}$ , alt. 37, diam. 23 mm.

Kogawaranuma, Mutsu.

*C. nipponensis* is chiefly characterized by its wide, smoothish nymphs, distinct, smooth lunule, fine striation, and by having the lateral teeth usually not curved at the ends by the encroachment of the posterior adductor muscle. It is closely related to *C. sadoensis*, but that is longer and less triangular, with shallower beak cavities, and the hinge-line forms a lower arch. *C. sadoensis* is evidently an insular modification of the widely distributed *C. nipponensis*.

The type lot of *C. nipponensis* consists of remarkably beautiful shells with a varnish-like gloss. In another lot from Mutsu at Jūsangata (Jūsamura), the shell is black, less lustrous, and smaller, length  $34\frac{1}{2}$ , alt.  $30\frac{1}{2}$ , diam. 19 mm.; the striation is very distinct, and there is usually a purple stain in the cavity of the beaks, which is not present in the type lot.

Other shells from Shariki-mura, Mutsu, are similar to the preceding or larger; length 38, alt. 35, diam. 23 mm.

The same species ranges southward along the west coast to Echigo and Matsue, Izumo. Here the shells are large and rounded, with very full beaks, much eroded in adults. The exterior is black, the inside whitish, blue-stained at the ends, and sometimes with a purple spot in the beak-cavity. An old shell measures, length 40, alt. 36, diam. 27.5 mm. These shells resemble the following variety in coloration.

*Corbicula nipponensis delicata* n. subsp. Plate VII, fig. 11, 12.

The shell is similar to *C. nipponensis* in general characters, but is smaller and thinner, the hinge and nymphs narrower. Surface finely striated, smooth at the beaks, blackish with several brown and black zones and sometimes some black rays, usually not conspicuous. The interior is light violet or whitish, paler in the middle, and marked with a purple or violet spot in the cavity of the beaks.

Length 25.5, alt. 24.8, diam. 14.8 mm.

Imaegata, Kaga.

This variety occurs also at Kahokugata, Kaga, uniform black specimens, and at Tōgōike, Hōki, where the shells are black, with the interior bluish-white or violaceous-white, with a very conspicuous purple spot in the cavity of the beaks.

### Explanation of Plate VII.

Fig. 1, 2.	<i>Corbicula orthodonta</i> Pils. Owari.
„ 3, 4.	„ <i>nipponensis</i> „. Kogawaranuma, Mutsu.
„ 5, 6.	„ <i>leana</i> Prime. Shikanjima, Osaka.
„ 7, 8, 9, 10.	„ <i>viola</i> Pils. Chikumanaiko, Lake Biwa.
„ 11, 12.	„ <i>nipponensis delicata</i> Pils. Iwaegata, Kaga.
„ 13, 14.	„ <i>awajiensis</i> Pils. Noda, Awaji.
„ 15, 16.	„ <i>sadoensis</i> „. Sado.
„ 17, 18.	„ <i>sandai</i> Reinh. Lake Biwa.